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华北始新世兔类化石*

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兔形目中現知最早的化石是蒙古晚古新世的原古兔（*Eurymylus*）。它代表着該目中相当特殊的一科，与后期分布相当普遍的兔科及短耳兔科无直接的亲緣关系。漸新世时，兔形目化石已很繁多，分化复杂，但由于更早期的化石发現的少，它們的起源和地理分布都不很清楚。始新世是兔类起源和分化的重要时期，发現的化石却极稀少。截止目前仅找到有晚始新世的三属五种，卽北美的 *Mytonolagus petersoni*, *M. wyomingensis*; 亚洲的 *Shamolagus grangeri*, *S. medius* 和 *Gobiolagus tolmachovi*; 发現的材料也很零星不全，如上述亚洲的三种中，全部化石仅有四件破碎的下頜骨，美洲的材料同样也很稀少。始新世在兔形目进化中的重要性和材料的缺少情况，使得这一时期中每一件化石的发現都具有重要的古生物学意义。

本文記述的兔类化石采自华北晚始新世的三个地点：1. 河南卢氏孟家坡，化石是两件上頜骨，代表一原始的新属：*Lushilagus*; 2. 內蒙烏兰察布盟烏拉烏苏，化石主要是一件破碎的 *Shamolagus medius* 的骨架，具有完整的上、下頰齿；和 3. 陝西蓝田高坡，化石仅一个下臼齿。

为了描述方便和譯名求得統一，作者采用了伍特（Wood, 1940）的兔类頰齿齿尖命名办法，稍加增改后譯成中文插入文中，以供参考（插图 1）。

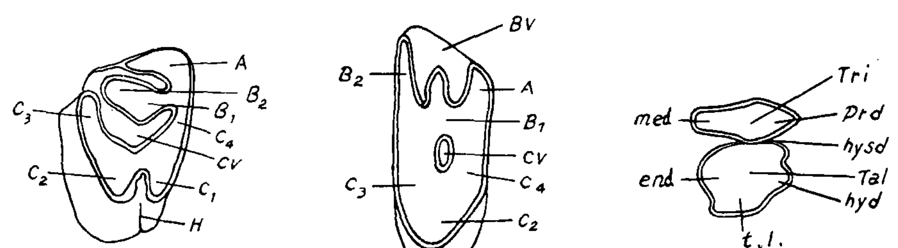


插图 1. 兔类頰齿齿尖名称
（依 A. E. Wood, 有增添）

A. *Palaeolagus temnodon* P^3 B. *Shamolagus medius* M_1 C. *Shamolagus medius* M_2

A metastyle 后附尖, B_1 metacone 后尖, B_2 paracone 前尖, C_1 hypocone 次尖,
C_2 protocone 原尖, C_3 anteroloph 前脊, C_4 metaloph 后脊, H hypostria 次沟,
CV crescentic valley 新月谷, BV buccal valley 唇面谷,
med metaconid 下后尖, end entoconid 下內尖, prd protocone 下原尖,
hyd hypoconid 下次尖, hysd hypostriid 下次沟, tri trigonid 三角座(齿座),
tal talonid 跟座, t.l. third lobe 第三叶,

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标 本 記 述

兔科 Leporidae Gray 1821

古兔亚科 Palaeolaginae Dice 1929

卢氏兔属 *Lushilagus* gen. nov.

属型种：洛河卢氏兔 *Lushilagus lohoensis* sp. nov.

特征：个体較 *Shamolagus* 小的原始兔类。前臼齿远未臼齿化；P^4 小于 M^2，仍为三叶式，具有不完全的前脊；頰齿横向較 *S. medius* 狭，輪廓近于方形，低冠，釉質层不退化、无次沟；M^3 在比例上較其他种属显著的大。

洛河卢氏兔[1] *Lushilagus lohoensis* sp. nov.

（图版 I，图 1，2）

正型标本：一左上頜骨，具 P^3—M^2 及 P^2、M^3 的部分齿槽（古脊椎动物与古人类研究所野外編号 57202，登录号 V. 3008）。

副型标本：一左上頜骨，具 P^3—M^1（登录号 V. 3009）。

地点及层位：河南卢氏孟家坡；卢氏組，晚始新世早期。

特征：同属的特征。

描述：上頜顴突前緣起于 P^4 中部，后根位于 M^1，M^2 之間，位置較 *Mytonolagus* 和 *S. medius* 者向后。顴弓前的咬肌窝深。由于齿冠低，頰齿向上伸到顴弓根部的水平即停止，不象后期的兔类伸近或伸至眼窝。

頰齿齿冠很低，釉質层发育完好，等厚；不象 *S. medius* 唇側釉質层变薄，更无 *Mytonolagus* 的缺失現象。上頰齿外緣的联綫成較圓滑的弧形綫。

P^2 仅在正型标本上保留了齿槽的后壁。牙齿較大，单根。

P^3 冠面輪廓为近方形。三叶，內叶大，无前脊。內叶与中叶間的沟深，伸至齿根部；在嚼面上該沟較平直，仅末端稍向外弯。后脊不显著。中叶較內叶小，但基部扩大。外叶最小，位于齿的后外角，成阜状尖，无附生的脊稜。牙齿双根，横排，內側者粗壮。

P^4 大于 P^3，小于 M^2。双根；內側微有收縮。牙齿远未臼齿化，仍保留了三叶的基本形式，构成这一新属的一个重要原始特征。三叶的大小和結构与 P^3 相似。由于前、后脊的加长在齿的中部形成了較清楚的新月型谷；在正型标本上外叶发育了低弱的脊稜。P^4 的前脊在 *L. lohoensis* 上清楚地分为內外两部分，說明它可能是两个起源，而不单是由原尖向外延伸而成。前脊的內側无疑地起于原尖前外側，沿齿的前緣外伸；外側可能由齿的前緣中部的齿緣发育而成（如副型标本）。在原始的兔科化石中，如 *Lushilagus*，內外两側被一清楚的沟所分开；而在后期的种属中，前脊的內外两側愈合构成完整的前脊，使新月谷完全封閉。

1）种名因化石地点靠近洛河而得名。

M^1 和其他早期兔类一样，为上頰齿中最大者，但它不象 *Mytonolagus* 和 *S. medius* 那样横向加寬，牙齿內側微有收縮。在正型标本上，M^1 的嚼面結构已被磨去，仅在齿的中部留有一小釉質环。在副型标本上，除中部釉質环外，还可以看到与 *S. medius* 相似的唇面谷。M^1 外側有两清楚的牙根。

M^2 仅保存在正型标本上，磨蝕很重，較 M^1 小，大于 P^4。牙齿外緣向后內傾斜，內側不很收縮。齿的中部亦仅留一釉質环。三根。

M^3 在正型标本上保留了齿槽后部。牙齿可能双根，外側者小。从齿槽看，*L. lohoensis* 的 M^3 在比例上較其他种属显著的大，約与 P^4 等寬。大的 M^3 同样也表明該属的原始特征。

測量： 見 28 頁(下同)。

沙漠兔属 *Shamolagus* Burke 1941

中間沙漠兔 *Shamolagus medius* Burke 1941

(图版 I，图 3—7)

特征： 大小与 *S. grangeri* 相近。上前臼齿較 *Lushilagus* 臼齿化的程度深。P^4 前脊发育完整，唇面谷封閉不完全。端齿 (terminal teeth，即 P^2_3，M^3_3) 較小，但有咀嚼功能；上頰齿較 *Lushilagus* 横向加寬，无灰沟。P_3 嚼面分为三叶，有一个外側和两个內側轉角 (reëntrant)；前叶大，近圓形，前部不收縮，无纵沟。中間的下頰齿外沟較 *S. grangeri* 者寬，齿座外側較尖，跟座自 P_4 至 M_2 逐漸增大。M_3 跟座后面有清楚的第三叶。(依 Burke，1941，有增改)。

材料： 一架破碎的骨骼，保存了左上頜骨，左、右下頜骨及上下頰齿列，左肱骨近端，右肱骨远端，右尺骨、撓骨近端及一段右脛骨，其余骨骼均破碎。整个骨架发現时粘附于 *Archaeomeryx* 的一具骨骼上(野外編号 7068，登录号 V. 3010)。一較年青个体的右下頜骨中段，具 P_4—M_2 和另外两个下臼齿(右 M_1，M_2)(野外編号：7511，7514；登录号 V. 3011)。

地点及层位： 內蒙烏兰察布盟錫拉木伦地区騰格諾尔湖东 10 公里烏拉烏苏井附近。晚始新世，錫拉木伦层。

描述： 上頜骨內側与腭骨相連的骨縫曲折地向后伸至 M^3 的后方。在腭骨 (Palatine) 的前端有一腭孔。頜骨外側的顴突前緣起于 P^3 后側，后緣止于 M^1 前部；顴突位置較 *Lushilagus* 者向前，与 *Desmatolagus vetustus* 者相似或稍后。

上頰齿齿冠較 *Lushilagus* 的高。端齿較小，但仍起咀嚼作用。上頰齿外緣的連綫較曲折。頰齿唇側的釉質层无缺失現象，但較 *Lushilagus* 的有所变薄。

P^2 的形状与 *D. vetustus* 的相似，成簡单的三叶状，外叶退化，內叶最大，中叶在冠面上略小于內叶，但向基部扩大，其前緣凸出于內叶之前。三叶于牙齿后部直接联結，后脊不显著。

P^3 呈卵圓形，內側收縮。冠面上仍为三叶状，內叶面积增大。原尖前側有一微弱的前脊。新月谷不及 *Mytonolagus* 的一些标本显著，与 *Lushilagus* 有些相似。中叶凸出于齿的前方，不为前脊所包裹。外叶退化，位于齿的后外角，无显著的脊稜。

P^4 近于臼齿化，前脊发育完全，有清楚的唇面谷。牙齿外緣平直，內側收縮不多。新月谷的前翼較短，为前脊所封閉；后翼加长，伸至唇面谷內，使唇面谷不象 *D. vetustus* 的那样封閉完整。后脊长，形成齿的后壁。后附尖和前尖不及 *Mytonolagus* 和 *D. vetustus* 的发育。

M^1 最大。虽比 *Lushilagus* 的横向加长，但远不及 *Mytonolagus* 的横寬。齿的內緣較 P^4 尖銳，外緣向后傾斜。新月谷經磨蝕后仅剩一釉質环。唇面谷的中部有一相当大的刺状尖自后尖伸向谷內，使谷的內緣成对称的“W”形。

M^2 与 *L. lohoensis* 者相反，略小于 P^4。牙齿輪廓較方，內側收縮不显著，外緣強烈向后傾斜。唇面谷較 M^1 者为小。

M^3 較 *Lushilagus* 的显著退化变小，与 *D. vetustus* 的大小相近。牙齿內側齿冠稍高，双根。冠面构造簡单，前部有一大的三角形咀嚼面(“齿座”)，后部有一不长的齿緣(“跟座”)。这种結构与 *Mytonolagus petersoni* 的不同（見 Burke, 1934, 图版 I, 插图 1, 2），后者在齿的外側有 W 形的唇面谷，內側有次沟，牙齿单根。

下頜骨大小、結构与 Burke (1941, 頁 3) 描述的正型标本一致，只是材料較为完整。頜骨体纖細，自 M_2 处向前更加薄弱。齿虛位长 6.5 毫米。有两頦孔，前者位于虛位中部偏上处，后者位于 P_4 跟座之下，位置較低。頜骨下側的前部略向上弯；垂直枝較 *S. grangeri* 的坡度为陡。咬肌窝不深，其前端有一球状結节，窝的上緣有一較显著的脊稜。下頜骨的角突可能不大較圓。下頜联合部为长橢圓形，长約 5 毫米。下門齿切面的前緣較直。門齿沿下頜骨的下緣延伸，后端起于 M_2 的前下方。

下頰齿低冠，齿冠与齿根界面清晰。頰齿双根，前后排列，在不同程度上两齿根的中部愈合。齿的外壁較 *Mytonolagus* 的凸圓。无白堊質，釉質层在中間頰齿的前緣变薄，但不缺失。

P_3 与正型标本相似，唯后部略寬；冠面成前后三叶；內側有两轉角，較浅小，經磨蝕后消失快；外側有一大而寬的轉角，較深，位置較正型标本的稍后。冠面上前叶成圓形，前部不收縮，无縱沟。中叶与外側轉角相对，其外后部与后叶相合。后叶最寬，但外側不及正型标本的輪廓方圓。后叶的內后角有一較正型标本清楚的小轉角。

中間下頰齿 (P_4—M_2) 結构相似，M_2 最大。各牙齿都有一寬短的齿座和前后加长的跟座。在横向上齿座两端远伸出跟座之外，不象 *Mytonolagus* 两者近于等寬。齿座的外側变尖，尖銳程度自 P_4 至 M_2 逐次增加；每个齿座外緣都比 *Mytonolagus* 的尖銳。跟座的大小亦自 P_4 向 M_2 递增。由于跟座的前外緣收縮，使下次沟較 *S. grangeri* 的寬。在磨蝕程度不深的 V. 3011 标本上，下頰齿跟座后部有一小的第三叶。可以看出，随着磨蝕的加深，第三叶会逐漸消失，愈合于跟座之中。*S. medius* 的新材料說明下頰齿的第三叶存在与否可能与年齡有关，而不是一个固定不变的特征。类似的情况在北美的 *Palaeolagus* 属中也有記載(Wood, 1940, 頁 302)。因此，象古列耶夫 (Гуреев, 1960) 以下頰齿的第三叶存在做为兔形目分类的主要根据是值得愼重考虑的，据此所做出的分类系統也是令人难以全信的。

M_3 較 *S. grangeri* 的小，但稍大于 *D. vetustus* 的 M_3。牙齿在跟座后部有一不及 *S. grangeri* 显著的第三叶，該叶至齿冠基部即与跟座相合、消失。

肱骨近端有較长的三角板粗隆。粗隆自大結节起长約 16.5 毫米，自前扭曲。肱骨头較 *Palaeolagus* 的更悬伸出骨干之外（見 Wood, 1940. 图版 XXXV, 下同），成圓三角形，后部縮小。大結节与肱骨头等高，成前內—后外向的脊状結节。大結节与肱骨头間的沟浅。中部骨干的切面近圓形。肱骨的远端較 *Palaeolagus* 的显著为狹，横向最大寬度仅 5.5 毫米。外髁上脊成尖稜状，滑車上孔不大，鷹嘴窝与冠状窝浅。与 *Palaeolagus* 不同，內髁上脊孔不是貫穿的孔，而是在骨的前面形成一狹长的深窝，其位置略高于滑車上孔。

尺骨与撓骨近端完全分离，但两骨紧密相靠。与 *Lepus* 相反，尺骨骨干粗于撓骨；也不同于 *Palaeolagus* 者，两骨等粗。在側面上，两膊骨的骨干比 *Palaeolagus* 的弯曲。尺骨近端的肘突长 4.5 毫米，与骨干无显著分界；近端的撓骨头成长卵圓形。

脛、腓骨仅保存了远端部分，从印痕上量得脛骨长約 50 毫米。远端脛腓骨愈合的部位較 *Palaeolagus* 的低，不到骨体长度的 1/2。

？戈壁兔　？*Gobiolagus* sp.

（图版 I，图 8）

在烏拉烏苏地点和 *S. medius* 一起发現的还有一块破碎的左上頜骨，具 M^1，M^2（野外編号 7511，登录号 V. 3012）。个体大小与 *S. medius* 相近，但結构不同。上頜顴突中部向上凹陷很深，顴突后根止于 M^1、M^2 之間，与 *Lushilagus* 相似，比 *S. medius* 的位置向后。M^1 近于矩形，內側不象 *S. medius* 的收縮。齿冠較高，舌面側的釉质层伸至根尖部。具次沟，沟长約为齿冠的 1/2。唇面谷較浅，可能較 *S. medius* 的消失稍早。唇側釉质变薄，但不缺失。具三齿根。M^2 小于 M^1，横向更短，外緣強烈向后內傾斜。唇面谷的后部远伸至齿的內側，使谷的內側成不对称的 W 型，与 *Shamolagus* 的不同。

从顴突位置、頰齿形状、具次沟及唇面谷的形状等特点上，不难看出，它与 *Shamolagus* 有所区别，也不同于漸新世的 *Desmatolagus*。可能为一与 *S. medius* 同时代的 *Gobiolagus*（Burke, 1941）的上頜骨。但由于該属过去无上頰齿等材料发現，无法对比，只是它在大小上較近于晚始新世的 *G. tolmachovi* 种。

古兔亚科 Palaeolaginae indet.

（图版 I，图 9）

古脊椎动物与古人类研究所蓝田野外队于 1964 年 6 月在陝西蓝田泄湖鎮高坡村附近的老第三系白麓塬組白砂岩中采到一个兔类化石的右下 M_1（野外編号 64005，登录号 V. 3013）。牙齿較 *S. medius* 的 M_1 略大，从它的齿冠較高、牙根短、釉质层退化（在齿冠外側高为 5.5 毫米时，牙齿前緣中部的釉质层已完全缺失）和牙齿外側較陡等特点看，它有着較 *S. medius* 进步的特征。但比某些漸新世，特别是晚漸新世的种属如 *Desmatolagus gobiensis* 等又較为原始，如齿冠相对較低、无白堊质等。它可能相当于 *Shamolagus* 后期或 *Desmatolagus* 初期阶段的化石，它的时代可能是始新世末期或漸新世初期。

結　　語

1. *Lushilagus* 无論从层位或牙齿构造上，无疑是兔科中現知的最原始和最早的一属。

在时代上，卢氏动物羣为晚始新世早期(或略早?)，它相当(或稍早)于含 *Shamolagus grangeri* Burke 的伊尔丁曼納层的时代，而肯定早于含 *S. medius* 的錫拉木伦层和含 *Mytonolagus petersoni* 的尤因他C带。从牙齿构造上，*Lushilagus* 的齿冠較低、P^4 仍保留着三叶式、远未臼齿化、M^3 較其他种属显著为大和顴弓位置向后等特点說明他在进化上比 *S. medius* 更为原始。*Lushilagus* 与 *S. grangeri* 的关系由于材料的不全尙难确定。但在个体上，卢氏兔則显然为小。若从 *S. medius* 的上下頰齿做簡接的比較，*S. grangeri* 的下頰齿虽比 *S. medius* 的原始，但两者相差不远。而 *L. lohoensis* 的上頰齿比 *S. medius* 的有显著的原始特征。这或許可以說明 *L. lohoensis* 比 *S. grangeri* 还原始些。从現有的材料看，由 *S. grangeri* 至 *S. medius* 的进化过程是比較清楚的，但 *L. lohoensis* 与 *S. medius* 間，就很难确定两者間有直接的嫡亲关系。也可能 *Lushilagus* 为后期的其他种属(如 *Gobiolagus*)的祖先类型。

2. *S. medius* 除了端齿稍大，P_3 为三叶、P^4 臼齿化較差、上頰齿无次沟等較原始的特点外，在形态上与早漸新世的 *Desmatolagus vetustus* Burke 已十分接近。正象 Burke (1941) 所指出的由 *S. grangeri* 經 *S. medius* 至 *D. vetustus* (甚至到晚漸新世的 *D. robustus*) 的进化过程是比較清楚的。

3. 华北始新世新发现的兔科化石进一步証明，亚洲的 *Lushilagus, Shamolagus* 和北美的 *Mytonolagus* 的区别是清楚的。两者在系統上代表着两个不同的枝系，分别衍生出不同的后期种属。在形态上，*Mytonolagus* 較亚洲的两属进步，它以如下特点与后两者相区别：(1)齿冠較高、釉质层退化較显著，(2)上前臼齿臼齿化的程度較深，(3)中間上頰齿横向相当的长，內側收縮显著，具次沟，和(4)下頰齿外側較陡直，在冠面上下原尖的外緣較鈍，齿座伸出跟座不多。上述亚、美两洲始新世兔类化石的区别表明兔科的分化当在晚始新世之前，中始新世或者更早。

測量(单位：毫米；測自冠面)

(Measurements: in mm; occlusal surface)

	长 (length)	宽 (width)
Lushilagus lohoensis sp. nov.		
正型标本 (Holotype, V. 3008)		
P^2	—	>1.5 (alv.)
P^3	1.2	1.8
P^4	1.4	2.3
M^1	1.5	2.8
M^2	1.5	2.6
M^3	—	2.2 (alv.)
副型标本 (Paratype, V. 3009)		
P^3	1.4	1.7
P^4	1.5	1.9
M^1	1.7	2.5
Shamolagus medius Burke		
上頰齿列 (upper cheek teeth, V. 3010)		
P^2—M^3	9.0	—
P^2	0.9	1.2
P^3	1.3	2.1
P^4	1.5	3.1
M^1	1.7	3.5
M^2	1.5	3.0
M^3	0.9	1.4
下頰齿列 (lower cheek teeth, V. 3010)		
P_3—M_3	8.5	—
P_3	1.5	1.3
P_4	1.6	1.8
M_1	1.9	2.0
M_2	2.1	2.1
M_3	1.3	1.1
下頰齿 (lower cheek teeth, V. 3011)		
P_4	1.6	1.6
M_1	1.8	1.7
M_2	2.0	1.8
? *Gobiolagus* sp. V. 3012		
M^1	1.8	3.3
M^2	1.7	2.6
Palaeolaginae indet. V. 3013		
M_1	2.5	2.7

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EOCENE LEPORIDS OF NORTH CHINA

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In the study of origin and early history of the order Lagomorpha, the central part of Asia played an important role. So far as is known, the oldest fossil record of three families of the order almost all limited within this region. *Eurymylus,* a sole genus of Eurymylidae from Upper Palaeocene of Mongolia, is the earliest known and unique form and may be "out from ancestry to the later members of the order" (Wood, 1957, p. 417) (*Mimolagus* of Kansu, probably also from Palaeocene may be refered to Eurymylidae). *Shamolagus,* occurred in Upper Eocene of Inner Mongolia, represented a more primitive leporid and is less progressive than *Mytonolagus* of North American. In Ochoctonidae, *Sinolagus* from Upper Oligocene of Kansu is contemporary with or slightly later than the European *Amphilagus,* an earliest genus of the Family. Nevertheless, the material of the early lagomorphs in this region, even in the world, is so rare that, for example, the Asiatic Eocene leporids, containing two genera and three species, only four fragmentary lower jaws were described, so that the origin and relation of the three families of the order are still obscure.

The specimen described in the present paper was discovered from three Late Eocene localities in North China: (1) Lushih District, Honan, possessing two upper jaws, representing a new genus, *Lushilagus,* which is more primitive than *Shamolagus;* (2) Ula Usu, Inner Mongolia, the material chiefly consists of a framentary skeleton of *Shamolagus medius*; and (3) Lantien District, Shensi, only an isolated lower molar.

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DESCRIPTION OF MATERIALS

Family Leporidae Gray 1821

Subfamily Palaeolaginae Dice 1929

Genus: *Lushilagus* gen. nov.

Genotype: *Lushilagus lohoensis* sp. nov.

Diagnosis: A genus more primitive and smaller than *Shamolagus.* Cheek teeth more brachyodont, enamal not reduced at buccal sides and without hypostriae; P^4 smaller than M^2, essentially trilobate with an incomplete anteroloph; midst upper cheek teeth shorter transeversely than in *S. medius*; M^3 distinctly larger than that of other forms.

*Lushilagus lohoensis** sp. nov.

(Pl. I, figs. 1, 2)

Holotype: A left maxilla with P^3-M^2 and part alveous of P^2 and M^3 (Field no. 57202, Cat. no. V.3008).

Paratype: A left fragmentary maxilla with P^3-M^1 (V.3009).

Diagnosis: as for the genus.

Locality and Horizon: Menchiapu, Lushih District, Honan; Lushih Formation, lower part of Upper Eocene.

Description: Anterior zygomatic root situated more posteriorly than in *S. medius* and *Mytonolagus,* with anterior border extending to the middle of P^4, and the posterior margin terminating behind M^1. The masseteric fossa is considerably deep as in *M. wyomingensis* figured by Gazin (1956, Pl. 1, fig. 1). The cheek teeth are more brachyodont, short transversely and without hypostriae. The prisms of the teeth extend upward only to the level of the superior margin of masseteric fossa. The enamal of the buccal side of cheek teeth, neither reduced as in *M. wyomingensis* nor thin as in *S. medius,* is of the same thickness as on the other parts of the tooth. The outline of the upper cheek teeth series approximates a smooth curve, not staggered as in *S. medius.*

P^2 not preserved, but the posterior margin of alveous of the tooth is shown on the holotype. It is single-rooted and looks larger than in other Eocene leporids.

P^3 is nearly quadrilateral in outline and not compressed antero-posteriorly on the inner side. It shows a trilobate triturating surface, with the lingual lobe largest, and lacks an anteroloph. The internal valley between inner and central lobe extends downwards toward the base of the crown and straightly, only slightly exterally at the end, from anterior to posterior side on surface. Thus the valley never becomes a typical crescentic one as shown in some American specimens. The central lobe is smaller than the inner one and swells toward the base. The external lobe, separated from the central one by a wider, shallow and longitudinal valley, is situated on the exter-posterior angle of the tooth, without any derivatives. P^3 (as well as P^4) of both specimen shows but one strong external rootlet.

* From Lo-ho, a river runs through the fossil locality.

P^4, in contrast with that of *Mytonolagus,* is smaller than M^2 and close to or slightly larger than P^3 in size. It is far from molarization and retains essentially primitive trilobatal pattern which may serve as an important feature for the genus. The tooth is similar to P^3 in genernal except that the inner side compresses antero-posteriorly, the crescent valley is slightly distinct, a weak crest developed on the anterior surface of metastyle in holotype and has an incompleted anteroloph. It is interesting that the anteroloph of P^4 of the new genus may originate from two parts, the inner one unquestionably arising from the anterior part of protocone as pointed by some authors; while the outer part is not directly enlarged from the inner one, but derived from a cingulum cusp on the middle of the anterior side of the tooth as shown on the paratype. The two parts mentioned are separated from each other by a small notch and may be fused into a complete anteroloph as in some latter forms of the Family.

M^1 is the largest of the upper cheek tooth series, less transverse and not far beyond P^4 on the external border as in *Mytonolagus,* with rather sharp inner side. There are two roots on the buccal side. The elements of the occlusal surface, except a enamal circle on the centre of the tooth, have been obliterate α by wear in holotype. A smaller and more shallow buccal valley with the pattern of a reëntrant deriving from the metacone as in that of *S. medius* remains in paratype.

M^2 only preserved on the holotype and is badly worn. The external border of the tooth is more inclined postero-internally than in M^1 and its inner side less compressed. There is also a enamal circle in the centre of the tooth.

Only a posterior wall of the alveolus is available for M^3. The tooth is larger than that of any later forms in size and its breadth approaches that of P^4. The larger M^3 indicated another primitive character for the genus. There are two roots, the external one smaller and the inner one larger.

Measurements: see page 28 in Chinese text.

Genus *Shamolagus* Burke 1941

Shamolagus medius Burke 1941

(Pl. I, figs. 3—7)

Diagnosis: Near *Shamolagus grangeri* in size. Upper cheek teeth brachyodont and without hypostriae; upper premolar more molarized than that of *Lushilagus lohoensis*; P^4 with a complete anteroloph and a unclosed buccal valley; terminal teeth smaller, but functional; P^4-M^2 transverser than in *L. lohoensis.* Crown of P_3 trilobate at occlusal surface, with one external and two internal reëntrants; anterior lobe sub-round in occlusal section, not compressed or grooved anteriorly; external valley of P_4-M_2 wider than in *S. grangeri*; M_3 with a small third lobe behind the talonid; size of talonid increases from P_4 to M_2; trigonids of midst lower cheek teeth more compressed antero-posteriorly along the protomere (based on Burke, 1941; revised with addition).

Material: A very fragmentary skeleton, the preserved parts including a left maxilla, two lower jaws, all with complete cheek tooth series, proximal half of left humerus, distal end of right humerus, parts of right ulna and radius and a fragmentary right tibia and fibula. The skeleton was adhered to the some skeletons of *Archaeomeryx* at the time of discovery (Field no. 7068 SSPE; Cat. no. V.3010). A right lower jaw with P_4-M_2 and two isolated lower molars (M_1, M_2) (Field no. 7511, 7514; Cat. no. V.3011).

Locality and Horizon: Ula Usu, Shara Murum district, Inner Mongolia. Upper Eocene, Shara Murum beds.

Description: The suture between the maxilla and palatine runs backwards to the posterior of M^3. There is a palate foremen on the anterior part of the bone with the level of M^1. Anterior root of zygoma situated more or less anteriorly than in *L. lohoensis* and is similar to that of *Desmatolagus vetustus,* a lower Oligocene leporid from Ulan Gochu, Inner Mongolia.

Cheek teeth slightly hyposodont than in *L. lohoensis.* Enamal slightly thinner on the buccal side of upper cheek teeth and anterior side of the lower. Hypostria on P^3-M^2 absent.

P^2 trilobatal and similar to that of *D. vetustus.* Inner lobe the largest, external one more reduced, central lobe smaller than the inner one on the occlucal surface, but swells downwards toward the base of the tooth.

P^3 is oval in outline, with inner side compressed antero-posteriorly. A weak anteroloph is seen at the antero-external corner of the protocone, but never enlarged buccally as in some specimens of *Mytonolagus.* Crescentic valley incomplete, and metaloph short. Central lobe protrudes beyond the anterior part of the tooth and is not involved by the anteroloph. Buccal lobe, as in *Lushilagus,* is the smallest, situated on the postero-external angle of the tooth, without distinct derivatives.

P^4 has a complete anteroloph and a distinct, but open buccal valley. The tooth is slightly sharp on its inner side. Anterior arm of the crescentic valley short, and cqlsed up by the anteroloph through wearing. In contrast with that of *D. vetustus,* the posterior part of crescentic valley extending into the buccal valley and paracone and metastyle more weaker.

M^1 is the largest and compressed antero-posteriorly. It exceeds P^4 in transverse dimension to an extent similar to that of *D. vetustus,* but distinctly shorter than in *Mytonolagus.* Its external border inclines backwards internally. The crescent valley remains into a small enamal circle. The buccal valley is inserted by a large reëntrant from the metacone and forms a 'W' pattern.

M^2 is slightly smaller than P^4 and similar to M^1 in general pattern except that the buccal valley is smaller and the inner side less sharp.

M^3 is near to that of *D. vetustus,* but is distinctly more reduced than in *Lushilagus* in size. It is slightly unihyposodont, with two roots and a relatively simple pattern. There is a larger triangular grinding surface on the anterior part and a cingulum on the intero-posterior side. It differs conspicuously from that of *Mytonolagus,* which has a hypostria, single root and a distinct buccal valley.

As in *Shamolagus grangeri,* the mandible is more slender and lighter. The diastema is 6.5 mm long. There are two mental foramens, the anterior one located on the midpoint of diastema and the other is beneath P_4. The slope of the ascending ramus is steeper than in *S. grangeri.* Masseteric fossa shallow, with a moderately boss-like tubercle. The symphysis is about 5 mm long. The incisor extends backwards beneath the anterior part of M_2, with a long and narrow cross section.

Lower cheek teeth similar to that of the type described by Burke (1941, p. 3). They are low-crown, without cement and possessing two antero-posterior roots. The external slopes of the teeth are more rounded than in *Mytonolagus.* The enamal of the an-

terior side of midest teeth thin, but never being absent.

As in the type of the species, P_3 has three reëntrants, one external and two internal. The external reëntrant located slightly posteriorly and labial part of third lobe is narrower than in the type.

Midst cheek teeth similar to each other, M_2 being and extending far beyond the talonid the largest. In contrast with *Mytonolagus*, the trigonids compressing antero-posteriorly and talonid incresed from P_4 to M_2 in size. Hypostriids are wider than that in *S. grangeri*.

A lower jaw, which is not badly worn (V.3011), has a small third lobe added to the talonids of M_1 and M_2. Apparently, this small lobe will be confluent with the talonid through wearing and the same situation was described by Wood (1941, p. 302) · in *Palaeolagus*. The change of pattern with the wear shows that the presence or absence of third lobe on lower cheek teeth in Leporidae is hardly reliable as the base for the classification of the Family as adopted by Гуреев (1960).

M_3 is smaller than that of *S. grangeri*, but slightly larger than in *D. vetustus* in size. Third lobe is less distinct than in *S. grangeri*.

The humerus shows some primitive characters than in the later leporids. There is a triangular head overhanging the shaft laterally. The deltoid crest of the priximal end is more longer and extends 16.5 mm in length from the head. The great tuberosity is in the same level of the head and its long axis directed innerantero-outerposteriorly. The bicipital groove is shallow. In contrast with *Palaeolagus*, the distal end of the humerus of the Chinese form is distinctly narrower, with the largest dimension of 5.5 mm transversely. The supratrochlear fenestra is morderate in size. Instead of being a hole as in *Palaeolagus*, the entepicondylar foramen becomes a narrow, long fossa on the anterior surface of the bone. The coronoid fossa and olecranon fossa are shallow.

Only the proximal 3/4 of the shaft of forearm is preserved. The radius and ulna are distinctly free, but in contact with each other. The shaft of ulna is thicker than that of radius, whereas in *Palaeolagus* they are equal. The forearm curved posteriorly at the middle part of the shaft in lateral view. The head of radius is oval and the olecranon is 4.5 mm long.

Only the shafts are available for the tibia and fibula. The tibia is about 50 mm long and its distal end fused with the fibula in slightly less than halfway of the bones, that is lower than that in *Palaeolagus*.

?*Gobiolagus* sp.

(Pl. I, fig. 8)

A left maxilla with M^1 and M^2 was collected together *S. medius* at Ula Usu (Field No. 7511, Cat. No. V.3012). It is about identical in size with *S. medius*, but differs from the latter in having: (1) the zygomatic root situated posteriorly; (2) M^1 more quadrate in outline and its inner side less sharp than *S. medius*; (3) a hypostria running about halfway of the crown, and (4) the posterior part of the buccal valley on M^2 extending more internally. These differences show that it is hardly referable to the *Shamolagus*, and may belong to *Gobiolagus*, another genus described by Burke (1941), of which untill now, its upper cheek teeth is still unknown.

图版說明 (Explanation of Plate)

Lushilagus lohoensis gen. et sp. nov.

1. 左上頜骨,具 P^3—M^2 (正型标本, V. 3008), 冠面视。×4。
   left maxilla, with P^3—M^2 (holotype, V. 3008), occlusal view. × 4.
2. 左上頜骨,具 P^3—M^1 (副型标本, V. 3009), 冠面视。×4。
   left maxilla, with P^3—M^1 (paratype, V. 3009), occlusal view. × 4.

Shamolagus medius Burke

3. 左上頜骨,具 P^2—M^3 (V. 3010), 冠面视。×4。
   left maxilla, with P^2—M^3 (V. 3010), occlusal view. × 4.
4. 左下頜骨,具 P_3—M_3 (V. 3010) 冠面视(上),側视(下)。×4。
   left lower jaw, with P_3—M_3 (V. 3010). occlusal (above) and laternal view (below). × 6.
5. 右 P_4—M_2 (V. 3011), 冠面视。×4。
   right P_4—M_2 (V. 3011), occlusal view. × 4.
6. 左肱骨近端 (V. 3010), 外側视。×2.66。
   proximal end of left humerus (V. 3010), external side. × 2.66.
7. 右肱骨远端 (V. 3010), 前视。×4。
   distal end of right humerus (V. 3010), front. × 2.66.

? *Gobiolagus* sp.

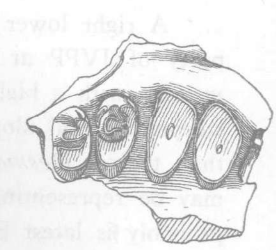
8. 左上頜骨,具 M^1, M^2 (V. 3012), 冠面视。×4。
   left maxilla, with M^1, M^2 (V. 3012), occlusal view. × 4.

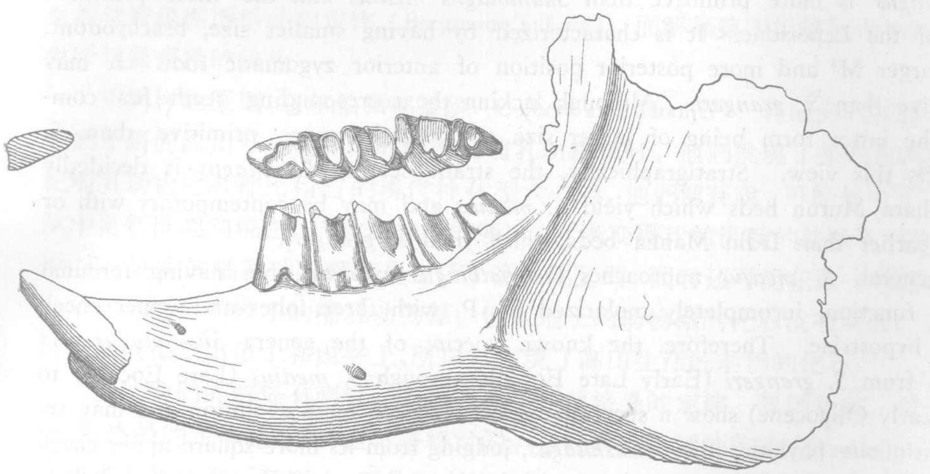
Palaeolaginae indet.

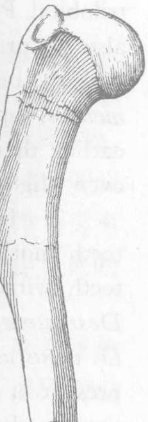
9. 右 M_1 (V. 3013), 冠面视(上),外側视(下)。×4。
   RM_1 (V. 3013), occlusal (above) and external view (below). × 4.

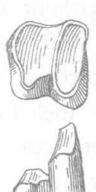

3


2


1

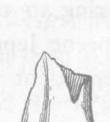

4


6


9

5


8


7

Palaeolaginae indet.

(Pl. I, fig. 9)

A right lower molar (M_1, Field No. 64005, Cat. No. V.3013) collected by a field party of IVPP at Lantian, Shensi in 1964. The tooth is slightly larger than that of *S. medius,* with a higher crown, shorter roots, reducing enamal on the anterior side and more steeper laternal slopes. It is distinctly more advanced than *Shamolagus,* but primitive than typical *Desmatolagus* in having relatively low crown and without cement. The tooth may be representing a new form intermediate between *Shamolagus* and *Desmatolagus* and probably is latest Eocene or Early Oligocene in age.

CONCLUSION

1. *Lushilagus* is more primitive than *Shamolagus medius* and the most primitive known form of the Leporidae. It is characterized by having smaller size, brachyodont, trilobital P^4, larger M^3 and more posterior position of anterior zygomatic root. It may also be primitive than *S. grangeri.* Although lacking the corresponding teeth for comparison, but the latter form being of larger size and slightly more primitive than S. *medius* supports this view. Stratigraphically, the strata bearing *Lushilagus* is decidedly earlier than Shara Murun beds which yield *S. medius* and may be contemporary with or even slightly earlier than Irdin Manha beds which yield *S. grangeri.*

2. In general, *S. medius* approaches *Desmatolagus vetustus,* but having terminal teeth more in function, incompletely molarized P^4, P_3 with three lobes and upper cheek teeth without hypostriae. Therefore, the known species of the genera *Shamolagus* and *Desmatolagus.* from *S. grangeri* (Early Late Eocene) through *S. medius* (Late Eocene) to *D. vetustus* (Early Oligocene) show a successive stage of cheek teeth evolution and may represent a continuous phyletic line. *Lushilagus,* judging from its more square upper cheek teeth and posterior position of zygomatic root and others, may not belong to this phyletic line and perhaps is related to *Gobiolagus.*

3. *Lushilagus* and *Shamolagus* differ obviously from *Mytonolagus* of North American in having: (1) more brachyodont cheek teeth, with less reduced enamal, without hypostiae; (2) premolar less molarized; (3) midst upper teeth more narrow and inner side less compressing antero-posteriorly; and (4) lower cheek teeth less steep, protoconid tapering to the occlusal surface, trigonid far beyond talonid. These show that the Late Eocene leporids of the two continents may not be directly related and represent two independent phyletic lines from which the later forms were derived respectively.